IN THE CLAIMS

1. (Original) A fast Fourier transformation method of implementing a fast Fourier transformation in a parallel-processing computer comprising an input apparatus, a processing apparatus, which includes a plurality of processors each having one of memories and a network for transferring data among said memories employed for said processors, an output apparatus and an external storage apparatus, said fast Fourier transformation method comprising the steps of:

dividing data serving as an object of said Fourier transformation into a plurality of data portions and distributing said data portions to said processors in order to store said data portions in said memories employed for said processors;

further dividing each of said data portions distributed to said processors into a first data part and a second data part and driving every individual one of said processors to carry out a process on said first data part of said data portion distributed to said individual processor; and

driving every individual one of said processors to carry out a process on said second data part of said data portion distributed to said individual processor and, at the same time, concurrently carry out processing to relocate results of said process carried out on said first data part by reassigning said results among said processors.

2. (Original) A fast Fourier transformation method according to claim 1,

wherein said process carried out on said first data part and said process carried out on said second data part are each a process of a Fourier transformation performed on said data parts in the direction of a first axis; and

wherein said method further comprises the step of, subsequently to the step of relocating results of said process carried out on said first data part, carrying out a process of said Fourier transformation performed in the direction of a second axis on said data relocated among said processors.

3. (Original) A fast Fourier transformation method according to claim 2 wherein:

said first data part of each of said data portions is pieces of data included in a data array serving as an object of said Fourier transformation as even-numbered pieces

of data each set in said direction of the second axis; and

said second data part of each of said data portions is pieces of data included in said data array serving as an object of said Fourier transformation as odd-numbered pieces of data set in said direction of the second axis.

4. (Original) A fast Fourier transformation method according to claim 3 wherein, concurrently with said step of carrying out said Fourier-transformation performed in said direction of said second axis on said relocated data, every individual one of said processors relocates results of said Fourier transformation carried out in said direction of said first axis on said second data part of said data portion pertaining to said individual processor by reassigning said results to the other ones of said processors.

5. (Original) A fast Fourier transformation method according to claim 4, further comprising the steps of:

carrying out said Fourier transformation in said direction of said second axis on data of said relocated second data part of each of said data portions upon completion of said step of relocating said results of said Fourier transformation carried out in said direction of said first axis on said second data part of each of said data portions; and

carrying out an end process of said Fourier transformation performed in said direction of said second axis on said data serving as an object of said Fourier transformation by using both results of said Fourier transformation performed in said direction of said second axis on said second data part of each of said data portions and results obtained earlier as results of said Fourier transformation performed in said direction of said second axis on said first data part of each of said data portions.

6. (Original) A 3-dimensional fast Fourier transformation method of implementing a 3-dimensional fast Fourier transformation in a parallel-processing computer comprising an input apparatus, a processing apparatus, which includes a plurality of processors each having one of memories and a network for transferring data among said memories employed for said processors, an output apparatus and an external storage apparatus, said 3-dimensional fast Fourier transformation method comprising the steps

of:

dividing data into data portions each laid out on one of planes, which are oriented perpendicularly to the direction of a Z axis and arranged to form a rectangular solid with dimensions of NX, NY and NZ, where NX and NY are side lengths of said rectangular solid in the directions of X and Y axes respectively whereas NZ is a side length of said rectangular solid in said direction of said Z axis, and distributing said data portions to said processors in order to store said data portions in said memories employed for said processors;

driving every individual one of said processors to carry out a transformation process in said direction of said Y axis only on data elements each having an even X coordinate;

driving every individual one of said processors to carry out another transformation process in said direction of said Y axis only on data elements each having an odd X coordinate and, concurrently with said another transformation process, carry out a data transfer process on said data elements each having an even X coordinate so as to distribute data parts, which are each laid out on a plane perpendicular to said direction of said Y axis as a result of another division of said data, to said processors other than said individual processor in order to store said data parts in said memories employed for said other processors;

driving every individual one of said processors to execute the first $\log_2(N_X - 1)$ steps of a transformation process carried out in said direction of said X axis only on data elements each having an even X coordinate and, concurrently with said transformation process carried out in said direction of said X axis, carry out a data transfer process on said data elements each having an odd X coordinate so as to distribute said data parts, which are each laid out on a plane perpendicular to said direction of said Y axis as a result of said other division of said data, to said processors other than said individual processor in order to store said data parts in said memories employed for said other processors;

driving every individual one of said processors to execute said first $\log_2(N_X - 1)$ steps of said transformation process carried out in said direction of said X axis only on data elements each having an odd X coordinate;

driving each of said processors to execute the last step of said transformation

process carried out in said direction of said X axis; and

driving each of said processors to carry out a transformation process in said direction of said Z axis.

7. (Original) A 1-dimensional fast Fourier transformation method of applying a 1-dimensional fast Fourier transformation to data at N points in a parallel-processing computer comprising an input apparatus, a processing apparatus, which includes a plurality of processors each having one of memories and a network for transferring data among said memories employed for said processors, an output apparatus and an external storage apparatus, said 1-dimensional fast Fourier transformation method comprising the steps of:

dividing data serving as an object of said Fourier transformation into data portions each laid out on one of planes, which are oriented perpendicularly to the direction of a Z axis and arranged to form a rectangular solid with dimensions of NX, NY and NZ, where NX and NY are side lengths of said rectangular solid in the directions of X and Y axes respectively whereas NZ is a side length of said rectangular solid in said direction of said Z axis, and distributing said data portions to said processors in order to store said data portions in said memories employed for said processors;

driving every individual one of said processors to carry out a transformation process in said direction of said Y axis only on data elements each having an even X coordinate, and a multiplication process on twist coefficients;

driving every individual one of said processors to carry out another transformation process in said direction of said Y axis only on data elements each having an odd X coordinate as well as a multiplication process on twist coefficients and, concurrently with said another transformation process and said multiplication process, carry out a data transfer process on said data elements each having an even X coordinate so as to distribute data parts, which are each laid out on a plane perpendicular to said direction of said Y axis as a result of another division of said data serving as an object of said Fourier transformation, to said processors other than said individual processor in order to store said data parts in said memories employed for said other processors;

driving every individual one of said processors to execute the first $\log_2(N_X - 1)$ steps of a transformation process carried out in said direction of said X axis only on data elements each having an even X coordinate and, concurrently with said transformation process carried out in said direction of said X axis, carry out a data transfer process on said data elements each having an odd X coordinate so as to distribute said data parts, which are each laid out on a plane perpendicular to said direction of said Y axis as a result of said other division of said data serving as an object of said Fourier transformation, to said processors other than said individual processor in order to store said data parts in said memories employed for said other processors;

driving every individual one of said processors to execute said first $\log_2(N_X - 1)$ steps of said transformation process carried out in said direction of said X axis only on data elements each have an odd X coordinate;

driving each of said processors to execute the last step of said transformation process carried out in said direction of said X axis and a multiplication process on twist coefficients; and

driving each of said processors to carry out a transformation process in said direction of said Z axis.

8. (Original) A fast Fourier transformation method of implementing a fast Fourier transformation in a parallel-processing computer comprising an input apparatus, a processing apparatus, which includes a plurality of processors each having one of memories and a network for transferring data among said memories employed for said processors, an output apparatus and an external storage apparatus, wherein:

a monitor for observing status of said processors employed in said parallel-processing computer and status of communications among said processors shows that processing carried out by said processors comprise the following four phases:

a first phase of driving any individual one of said processors to carry out calculative operations only;

a second phase of driving any individual one of said processors to carry out calculative operations as well as operations to transfer data to said processors other than said individual processor at the same time;

a third phase of driving any individual one of said processors to carry out calculative operations as well as operations to transfer data to said processors other than said individual processor at the same time; and

a fourth phase of driving any individual one of said processors to carry out calculative operations only.

9. (Currently Amended) A weather-forecast computation system for computing a weather forecast by application of a fast Fourier transformation implemented by using a parallel-processing computer, said weather-forecast computation system adopting a fast Fourier transformation method ~~according to any one of claims 1, 6, 7 and 8~~ implementing a fast Fourier transformation in a parallel-processing computer comprising an input apparatus, a processing apparatus, which includes a plurality of processors each having one of memories and a network for transferring data among said memories employed for said processors, an output apparatus and an external storage apparatus, said fast Fourier transformation method comprising the steps of: dividing data serving as an object of said Fourier transformation into a plurality of data portions and distributing said data portions to said processors in order to store said data portions in said memories employed for said processors; further dividing each of said data portions distributed to said processors into a first data part and a second data part and driving every individual one of said processors to carry out a process on said first data part of said data portion distributed to said individual processor; and driving every individual one of said processors to carry out a process on said second data part of said data portion distributed to said individual processor and, at the same time, concurrently carry out processing to relocate results of said process carried out on said first data part by reassigning said results among said processors.

10. (Currently Amended) A electron-structure computation system for computing an electron structure by application of a fast Fourier transformation implemented by using a parallel-processing computer, said electron-structure computation system adopting a fast Fourier transformation method ~~according to any one of claims 1, 6, 7 and 8~~ implementing a fast Fourier transformation in a parallel-processing computer

comprising an input apparatus, a processing apparatus, which includes a plurality of processors each having one of memories and a network for transferring data among said memories employed for said processors, an output apparatus and an external storage apparatus, said fast Fourier transformation method comprising the steps of: dividing data serving as an object of said Fourier transformation into a plurality of data portions and distributing said data portions to said processors in order to store said data portions in said memories employed for said processors; further dividing each of said data portions distributed to said processors into a first data part and a second data part and driving every individual one of said processors to carry out a process on said first data part of said data portion distributed to said individual processor; and driving every individual one of said processors to carry out a process on said second data part of said data portion distributed to said individual processor and, at the same time, concurrently carry out processing to relocate results of said process carried out on said first data part by reassigning said results among said processors.